Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$y = e^{2x+1}$$

Answer choices:

A $y' = e^{2x+1}$

B $y' = 2e^{2x+1}$

C $y' = 2e^{3x}$

D $y' = (2x + 1)e^{2x+1}$

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Solution: B

Make a substitution, letting $u = 2x + 1$ and $u' = 2$. Then

$$y = e^u$$

Taking the derivative, we get

$$y' = e^u \cdot u'$$

$$y' = e^{2x+1} \cdot (2)$$

$$y' = 2e^{2x+1}$$

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Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$y = e^{\sqrt{x+1}}$$

Answer choices:

A $y' = \dfrac{e^{\sqrt{x+1}}}{2\sqrt{x+1}}$

B $y' = \dfrac{e^{\sqrt{x}}}{2\sqrt{x+1}}$

C $y' = \dfrac{e^{\sqrt{x+1}}}{\sqrt{x+1}}$

D $y' = e^{\sqrt{x+1}}$

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Solution: A

Make a substitution, letting

$$u = \sqrt{x+1}$$

and

$$u' = \frac{1}{2\sqrt{x+1}}$$

Then

$$y = e^u$$

Taking the derivative, we get

$$y' = e^u \cdot u'$$

$$y' = e^{\sqrt{x+1}} \cdot \frac{1}{2\sqrt{x+1}}$$

$$y' = \frac{e^{\sqrt{x+1}}}{2\sqrt{x+1}}$$

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Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$f(x) = 4xe^{5x^2-2}$$

Answer choices:

A $f'(x) = 4e^{5x^2-2}(1 + 5x)$

B $f'(x) = 4e^{5x^2-2}\left(1 + 5x^2\right)$

C $f'(x) = 4e^{5x^2-2}\left(1 + 10x^2\right)$

D $f'(x) = 4e^{5x^2-2}(1 + 10x)$

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Solution: C

To find the derivative of

$$f(x) = 4xe^{5x^2-2}$$

we'll first recognize that we need to use product rule.

$$f'(x) = \left(\frac{d}{dx}(4x)\right)\left(e^{5x^2-2}\right) + (4x)\left(\frac{d}{dx}\left(e^{5x^2-2}\right)\right)$$

Take each derivative, remembering to apply chain rule when we take the derivative of the exponential function.

$$f'(x) = 4\left(e^{5x^2-2}\right) + (4x)\left(e^{5x^2-2}\right)\left(\frac{d}{dx}\left(5x^2-2\right)\right)$$

$$f'(x) = 4\left(e^{5x^2-2}\right) + (4x)\left(e^{5x^2-2}\right)(10x)$$

$$f'(x) = 4e^{5x^2-2} + 40x^2e^{5x^2-2}$$

$$f'(x) = 4e^{5x^2-2}\left(1 + 10x^2\right)$$

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